Statistical Analysis of Cicada Physical Characteristics by Species and Gender

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Background

Cicada are a family of insects well known for producing various sounds and noises by vibrating membranes on the base of their abdomen. Their bodies feature two pairs of membranous wings. They're over 1,500 species of cicadas that can be found on every continent.

Hypothesis

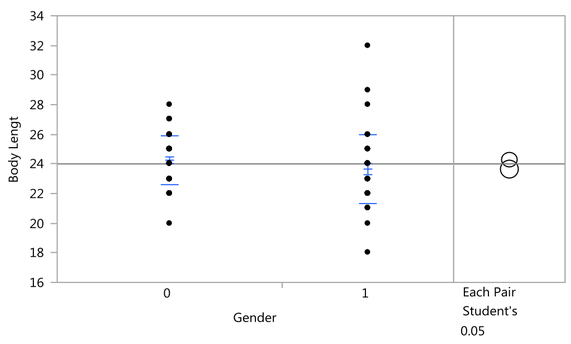
First, a t-test comparison of means comparing the wing width, wing length, body weight, and body length by gender will be performed using JMP 11 statistical software. The null hypothesis will be set to ($H_0\ \mu_1 = \mu_2$) and the alternative hypothesis is ($H_0\ \mu_1 \neq \mu_2$). The level of confidence used for this testing will be set to α=.05.

Secondly, an ANOVA comparison of means comparing the wing width, wing length, body weight, and body length by species will be performed using JMP 11. The null hypothesis will be set to ($H_0\ \mu_1 = \mu_2$) and the alternative hypothesis is ($H_0\ \mu_1 \neq \mu_2$). The level of confidence used for this testing will be set to α=.05.

Data

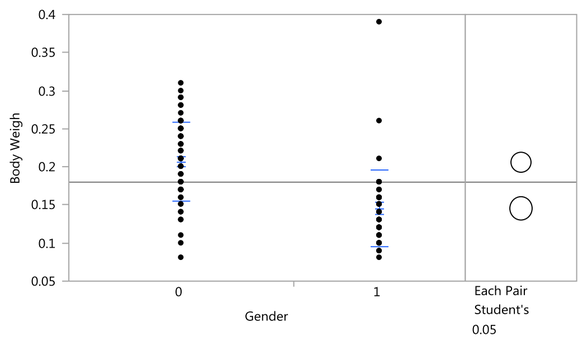
The data set being analyzed includes the body weight, wing length, wing width, and body length of 104 cicada specimens categorized by species and gender. The three *Magicicada* species are *treducala* (o), *tredecassini* (1), and *tredicim* (2). The source of this data is from Ginger Rowell and Robert Grammer of Belmont College.

Body Length by Gender



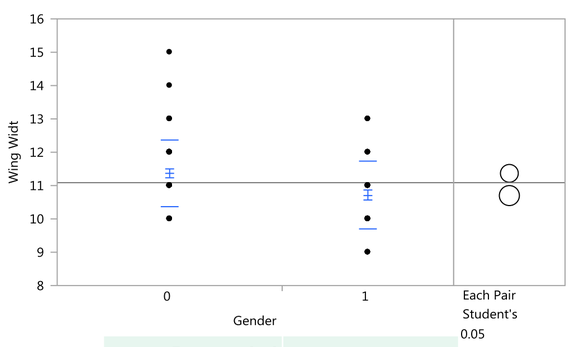
Prob > |t| 0.1275

Body Weight by Gender



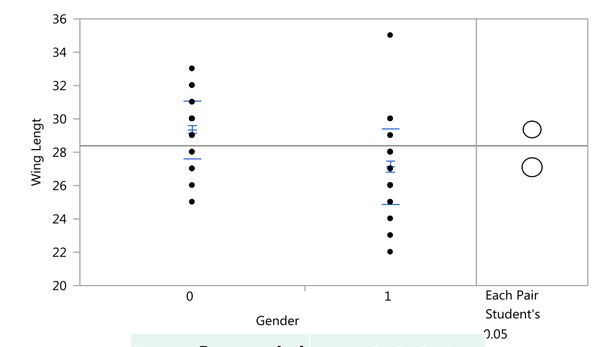
Prob > |t| <.0001*

Wing Width by Gender



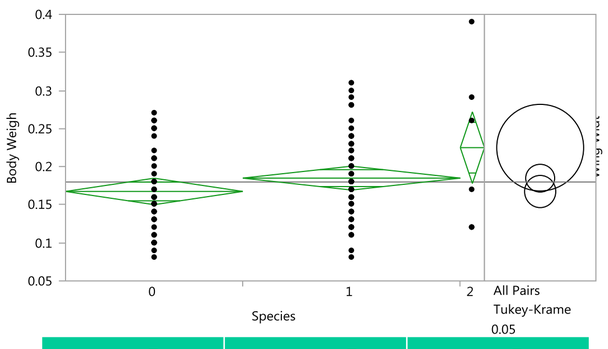
Prob > |t| 0.0013*

Wing Length by Gender



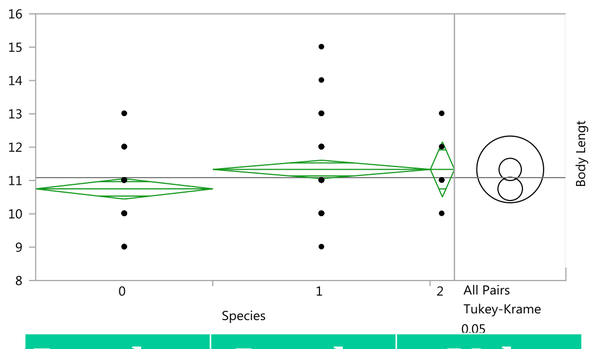
Prob > |t| <.0001*

Weight by Species



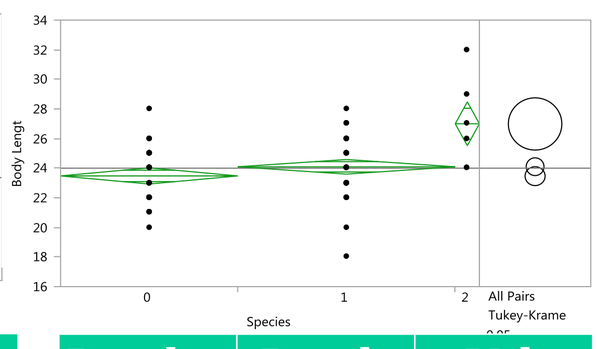
Level	-Level	p-Value
2	0	0.0643
2	1	0.2508
1	0	0.3037

Wing Width by Species



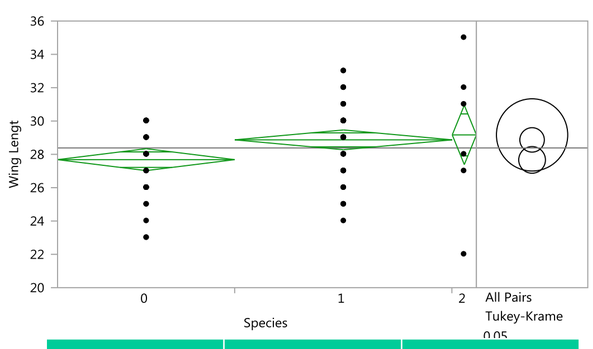
Level	-Level	p-Value
1	0	0.0163*
2	0	0.3924
2	1	1.0000

Body Length by Species



Level	-Level	p-Value
2	0	<.0001*
2	1	0.0010*
1	0	0.2267

Wing Length by Species



Level	-Level	p-Value
2	0	0.2716
1	0	0.0244
0	1	0.9474

Interpretation of Results

Based on the t-test comparison of means, there was a significant difference of body length, wing width, and wing length between male and female Magicicada. There was no significant difference of male and female Magicicada body length.

The ANOVA analysis failed to find any significant difference between the mean body weight of the three cicada species. There was a significant difference between the mean wing length of *tredecassini* and *treducala* species but not between any other species. There was a significant difference between the mean body length of *tredicim* and *tredecassini* species and between the *tredicim* and *treducala* species but no significant difference between *tredecassini* and *treducala* species. Finally, there was a significant difference between the mean wing width of *tredecassini* and *treducala* species but not between any other species.